# NEUROPSYCHOLOGY TODAY

*Monthly Newsletter published by Dr. Danov Neuropsychologist, P.C.*
*October 2009 Issue – Child Neuropsychology: ADHD*

## ADHD: General Information

Attention deficit hyperactivity disorder (ADHD) is the most common neurodevelopmental childhood disorder that affects 3%-7% of school-aged children in the US. This disorder is occurs in boys approximately twice as often as in girls. The symptoms of ADHD generally appear between the ages of 3 and 6, and may persist into adolescence and adulthood.[1,2]

To date, the cause of ADHD has not been established. Studies suggest that genes play an important role, since siblings and children of individuals with ADHD are likely to display the symptoms of the disorder. In addition, scientists are looking into the possibility of environmental factors, brain injuries, and nutrition as playing a contributory role in ADHD. Comorbidity of ADHD with oppositional defiant disorder, tic disorders, learning disorders, and autism spectrum disorders suggests that ADHD may be one of the manifestations of global neuropathology.[1,2]

To date, three subtypes of ADHD have been identified. Predominately Hyperactive-

*(Continued on Page 2)*

***Inside:***



## Diagnosing ADHD

There is no single test used to diagnose ADHD, and the diagnosis is complicated because the symptoms vary from person to person. Even though hyperactivity, impulsivity, poor self-regulation, and inattention are common in all young children, the diagnosis of ADHD is applicable only when these behaviors are more frequent and severe than expected for children of the same age. Further, the child must exhibit them for six months or more.[1]

Pediatricians often refer children to neurologists and neuro-psychologists. Generally, comprehensive neuropsychological assessments are preferred over single-informant reports, because they provide more thorough information about the nature and extent of the symptoms. Follow-up neuropsychological exams help determine the progression of ADHD symptoms, and response to special services and interventions.[1,3]

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## Neurophysiology in ADHD

Until recently, it was unclear whether ADHD was attributable to neurological or genetic abnormalities, or psychosocial issues. It is now established that the underlying pathology of ADHD is linked to neurodevelopmental abnormalities of the brain, although why this happens remains unknown.[4]

In 2007, a breakthrough neuroimaging study of 446 children (223 with- and 223 without ADHD) was published in the Proceedings of National Academy of Sciences by Dr. Shaw's research team of the National Institute of Mental Health. The children underwent one or more Magnetic Resonance Imaging (MRI) scans over the course of several years, which allowed both longitudinal and cross-sectional evaluation and mapping of their neuro-physiological brain development.[4]

In this study, the children's brain scans provided sufficient data to identify the age of attaining peak cortical thickness in different regions of the brain. It was found that both ADHD and non-ADHD groups of children followed a similar overall pattern of brain development; however, the timing of peak brain maturation was different for the two groups.[4]

Even though the age at which peak sensorimotor cortical maturation occurred for the ADHD and non-

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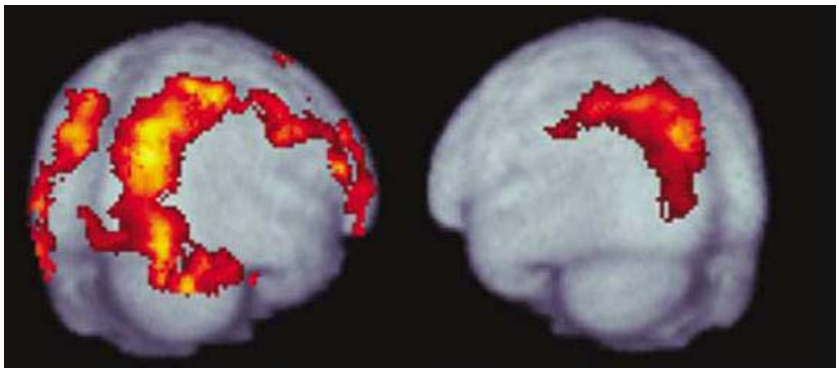
*("ADHD: General Information," continued from p. 1*)

Impulsive subtype is mainly associated with difficulty sitting still, poor impulse control, fidgeting, impatience, and excessive talkativeness. On the other hand, children with Predominately Inattentive subtype of ADHD mostly exhibit poor attention, distractibility, and a tendency to "space out" during tasks, although can focus while playing videogames or watching TV. Children with Inattentive ADHD type also have difficulty following directions and may fail to turn in their homework. Finally, Combined subtype of ADHD refers to a nearly equal proportion of hyperactive/impulsive and inattention symptoms. Most children have this form of ADHD.[1,2]

At this time there is no cure for ADHD, although there are a number of symptomatic treatment methods available, including psychotherapy, medication, education, training, or a combination of these treatments.[1,2]

When it is suspected that a child has ADHD, pediatricians, neurologists, or school recommend a neuropsychological evaluation to determine whether ADHD is present and to measure the extent of inattention and co-existing cognitive problems. A child with ADHD may be eligible for a individualized education plan (IEP) under the Individuals with Disabilities Education Act.[1]

School psychologists are qualified to administer IQ and academic tests to children with ADHD and learning problems, but they do not diagnose with any disorders. Alternatively, parents may have their child evaluated by a licensed neuropsychologist, who will administer several tests to measure IQ, academic, memory, attention, processing speed and accuracy, visuomotor, spatial, planning, and organization skills. Neuropsychologists issue a formal diagnosis or rule out a suspected diagnosis. Follow-up neuropsychological testing can also help monitoring improvement or worsening of ADHD symptoms and child's response to medication treatment.[1,3]



*The image of statistical brain imaging maps above show that normally developing boys (left) exhibit more extensive brain activation during a mental rotation task compared to boys with ADHD (right).*

*("Diagnosing ADHD," continued from p. 1)*

Neurologist or neuropsychologist gathers information regarding the child's behavior and environment, and rules out other potential causes of ADHD-like symptoms, such as traumatic events, head injury, or a neurological condition.[3]

Neuropsychological evaluation includes a clinical interview with the child and parent(s) in order to obtain relevant demographic, clinical, and medical information; and a comprehensive battery of neurocognitive tests. These tests are non-intrusive and assess various cognitive skills, such as memory, comprehension, the speed of information processing, as well as general intelligence.[3]

The results of testing provide a thorough description of the child's neurocognitive functioning and help identify the child's cognitive strengths and weaknesses. Based on these results, neuropsychologist may diagnose a child with ADHD and recommend various interventions to address the symptoms.[3]

**About Dr. Rimma Danov**

Dr. Rimma Danov received her PhD in clinical psychology from Adelphi University in NY. She completed her internship in clinical psychology and neuropsychology at Harvard Medical School and postdoctoral fellowship in pediatric and adult neuropsychology in a private clinic affiliated with NJ Medical School and the Robert Wood Johnson Medical Center. She is an assistant clinical professor at Penn State University, Dept. of Kinesiology, and has served as an assistant clinical professor at NYU School of Medicine, Dept. of Neurology, and Adelphi University, Derner Institute. In the past, she worked as a neuropsychologist for the NJ Devils Hockey Team and was engaged as a co-investigator of TBI in boxers at the NYS Athletic Commission.

Presently, Dr. Danov maintains a full-time private neuropsychology practice where she examines neurocognitive and neurobehavioral functioning of patients 2-90 years of age with various neurological and neuropsychiatric disorders, such as MS, TBI, CVA, Parkinson's, Alzheimer's, dementia, ADHD, PDD, Autism, learning disabilities, seizures, and many others, using state-of-the-art neuropsychological techniques. Dr. Danov also conducts and publishes research in these areas. She is available for medico-legal consultations and testimony.

*("Neurophysiology in ADHD," continued from page 1)*

ADHD groups was nearly the same, the children with ADHD demonstrated a significant delay in their frontotemporal cortical development. Specifically, children without ADHD attained peak frontotemporal cortical thickness around the age of 7.5 years, while the ADHD group reached this milestone only around the age of 10.5 years. The main function of fronto-temporal regions of the brain is to integrate and interpret information from lower-order sensory areas, and guide the control of attention and action. A delay in these areas by several years explains age-inappropriate impulse control and inattention in children with ADHD.[4]

The most pronounced delay of approximately 5 years occurred in the ADHD children's prefrontal cortex, which is linked to such cognitive functions as response inhibition, effortful attention, consequential thinking, higher-order motor control, and working memory (see the graph below). Deficits in these neuropsychological areas have been consistently identified in children with ADHD.[4]

## ADHD and the Comorbid Factors

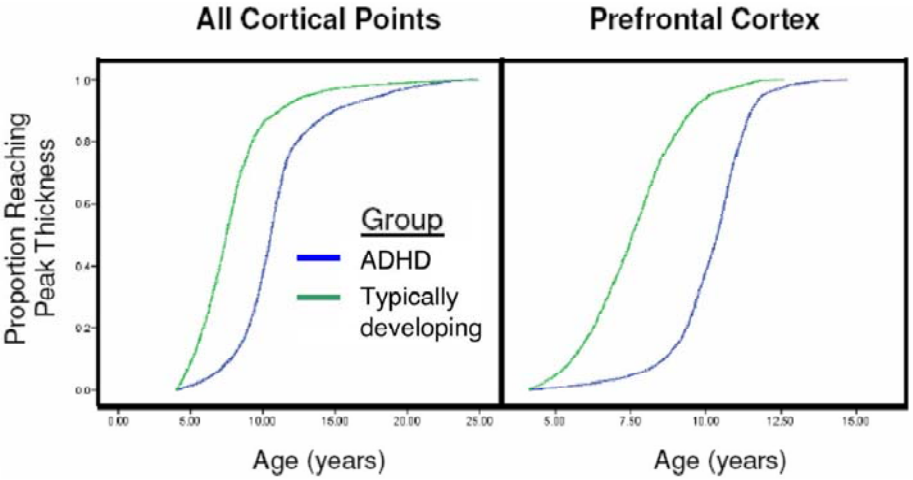
Children with ADHD are at a higher risk of certain neuropsychological, academic, psychosocial, and somatic problems. For this reason, it is important to employ multidimensional assessment in order to identify and address factors that are frequently found in children with ADHD.[5]

For instance, children diagnosed with ADHD are more likely to demonstrate poor motor coordination and balance than other children. Coupled with impulsivity and hyperactivity, poor motor coordination may contribute to these children's tendency to sustain unintentional injuries, including head injuries.[5]

Upon school entry, children with ADHD frequently have difficulty with basic math and pre-reading skills, followed by academic problems throughout school. Notably, children with ADHD tend to have lower IQ scores and are less likely to graduate from high school compared to their normally healthy counterparts.[5]

Further, children diagnosed with ADHD are often characterized by high levels of disruptive behavior and conflicts with parents, teachers, and peers. They are more likely to be rejected and bullied by other children, which may result in social isolation. Finally, children with ADHD are at a higher risk of sleep problems.[5]

As mentioned earlier, ADHD is frequently comorbid with a variety of conditions, such as seizure disorders, learning disabilities, conduct disorder, oppositional defiant disorder, anxiety, depression, and substance use. Research shows that comorbidity with other conditions predict a more severe course of ADHD and poorer outcomes.[5]




*The graph above demonstrates that the ADHD group displayed a delay in cortical maturation of the brain (left), particularly in the prefrontal cortical regions (right), which are associated with response inhibition, sustained attention, and other functions found to be impaired in ADHD.[4]*


**Works cited:**

1. NIH, NIMH (2003). *ADHD.* nimh.nih.gov/health/publications/attention-deficit-hyperactivity-disorder/complete-index.shtml
2. CDC (2009). *ADHD.* cdc.gov/ncbddd/adhd/data.html
3. Frazier et al. (2004). Meta-analysis of intellectual and neuropsychological test performance in ADHD. *Neuropsychology* 18: 543-55.
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1. Background image (pp.1,4): Jeff Johnson Biolog. & Medic. Visuals
2. Child (p.1): exceptional children.com.au
3. Brain activation (p.2): Vance et al. (2007). An fMRI investigation of right parietal function using… *Molecular Psychiatry* 12: 793.
4. Graph (p.3): from "Works cited" #4.

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**Next Issues-** Nov'09: Alcoholic Encephalopathy; Dec'09:Premature Birth

### We take the following insurance plans:

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| Aetna | Magnacare |
| Amerigroup | Medicare Cigna |
| BCBS | MHN |
| Elderplan | Multiplan |
| Fidelis | No-Fault |
| First Health | Tricare |
| HealthNet | UHC/Oxford |
| Health Plus | Workers' Comp |
| HIP | 1199 |

Case dependent:

| | |
|---|---|
| Affinity | GHI HMO |
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| Atlantis | |

Each insurance carrier determines the medical necessity of every requested neuropsychological exam differently. Our billing staff determines whether the exam will be covered by the insurance before the exam begins and works very hard to obtain an authorization, if needed. If you have questions about a plan that is not listed here, contact our office to find out whether we can obtain an authorization or have recently joined that plan.

### Languages

We are open to diverse cultures in this practice and value the quality of a bilingual neuropsychological exam performed in the patient's native language. Dr. Danov is a native Russian speaker. Her current clinical staff include native ***Russian***, ***Spanish*** and ***Hebrew*** speakers.



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